

Patent Claims

1. An electric generator/motor system, in particular for application in mobile units, motor vehicles, ships and the like as an on-board power system generator and starter, having:

a rotational field machine (DM) with three generator phase windings (a, b, c) and a pulse-controlled inverter which has a predetermined maximum power and is connected to the three generator phase windings (a, b, c) of the rotational field machine (DM), characterized in that the pulse-controlled inverter is divided into a first and a second pulse-controlled inverter (PWR1, PWR2) which are identical to one another and which have half the maximum power, the first and second pulse-controlled inverters (PWR1, PWR2) each have three branch pairs (S1, S4; S2, S5; S3, S6), each of the three branch pairs (S1, S4; S2, S5; S3, S6) is connected to an associated winding of the three generator phase windings (a, b, c) and is composed of at least two symmetrically arranged electronic branch switches (S1 to S6) which are located in series with one another in the same direction, the branch pair (S1, S4; S2, S5; S3, S6) is connected to a d.c. voltage source via the branch switches (S1 to S6), wherein the generator phase windings (a, b, c) are connected between a pole of the d.c. voltage source and the center point of the associated branch pair (S1, S4; S2, S5; S3, S6), in each case a filter capacitor (C1, C2) is connected in parallel with the branch pairs (S1, S4; S2, S5; S3, S6) of the first and second pulse-controlled inverter (PWR1, PWR2), and an electronic switch (S7) is formed by a positive busbar which connects the first pulse-controlled inverter (PWR1) and the second pulse-controlled inverter (PWR2) to a positive pole of the d.c. voltage source and via which the positive busbars of the pulse-controlled inverters (PWR1, PWR2) can be connected and disconnected from one another.

2. The electric generator/motor system as claimed in claim 1, characterized in that the electronic switch (S7) is unidirectional.

3. The electric generator/motor system as claimed in claim 1, characterized in that the electronic switch (S7) is a power MOS transistor with a parasitic reverse-biased diode.

4. The electric generator/motor system as claimed in claim 1, characterized in that the electronic switch (S7) is a bidirectional switch.

5. The electric generator/motor system as claimed in one of claims 1 to 4, characterized in that the branch switches (S1 to S6) are power MOS transistors with a parasitic reverse-biased diode.

6. The electric generator/motor system as claimed in one of claims 1 to 5, characterized in that the rotational field machine (DM) has such an increased number of stator turns that when only one pulse-controlled inverter (PWR2) is connected into the circuit it is possible to bring about a flux linkage which corresponds to a flux linkage when the entire pulse-controlled inverter, i.e. the first and second pulse-controlled inverters (PWR1, PWR2) are connected into the circuit, without increasing the number of stator turns.

7. The electric generator/motor system as claimed in one of claims 1 to 6, characterized in that furthermore a control unit is provided which under partial load implements a characteristic-diagram-dependent switchover point from a star circuit operating mode into a single phase circuit in a way which is optimized in terms of efficiency.

8. A method for operating a generator/motor system as claimed in one of claims 1 to 7, characterized by the steps:

operation of the generator/motor system in a star circuit by keeping closed the branch switch (S1 to S3), arranged on the side of the positive pole of the d.c. voltage source, of the first pulse-controlled inverter (PWR1) and keeping open both the branch switches (S4 to S6) which are arranged on the side of the negative pole of the d.c. voltage source and the electronic switch (S7) as well as all the branch switches of the second pulse-controlled inverter (PWR2);

sensing the rotational speed of the rotational field machine (DM) and determining a characteristic-diagram-dependent switchover point;

switching over the generator/motor system at the determined switchover point to operation in the single phase circuit by means of the control unit by closing the electronic switch S7 and actuating the first pulse-controlled inverter in such a way that each generator phase winding (a, b, c) receives its own H bridge, i.e. by all the branch switches of the first and second pulse-controlled inverter (PWR1, PWR2) being closed.

9. The method as claimed in claim 8, characterized in that the switchover point is determined in a way which is optimized in terms of efficiency.